HEAVY BRIGADE OFFENSIVE RECONNAISSANCE OPERATIONS: A SYSTEMS PERSPECTIVE

A MONOGRAPH
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The U.S. Army, over the past ten years, has enhanced the ability of heavy brigades to conduct offensive reconnaissance operations, yet brigades have not significantly attained a higher rate of success. Success is defined as the commander receiving the intelligence he requires in time to make and execute operational decisions. Systems theoriest have developed a technique called "systems thinking" to gain perspective on such difficult problems. This monograph will determine if systems thinking can identify the source of the reconnaissance problem.

The Army began to recognize the reconnaissance problem at the National Training Center (NTC) when it began training rotations in the early 1980s. This monograph will examine four studies that examined this reconnaissance problem at the NTC. The first three studies observed training rotations in the mid-1980s. Their conclusions and recommendations were largely implemented by the Army by the early 1990s. Unfortunately, the fourth study, published in 1996, determined that the heavy brigades still had significant problems conducting reconnaissance operations.

Using a theoretical systems model based on the physical and moral environment of war, the monograph examined the mental model of the reconnaissance studies and found that the true problem is not seen. The cybernetic feedback process in the complex-adaptive command system acts as a stabilizing force. In the NTC mental model, this stabilizing force does not exist. A solution to recognize this system feedback is to educate leaders and soldiers in the moral aspects of war and its enabling and disabling effects. The training scenario should incorporate these effects as much as possible and discuss them in after action reviews. Additionally, commanders need to combine the synergistic effects of all the ground, air, and technical reconnaissance assets. Commanders need to understand what combinations of these reconnaissance assets work, when, and how. The critical variable in the system is the commander. Success is largely determined on his intuitive ability to anticipate and adapt to the situation as it is, in the environment that it exists.

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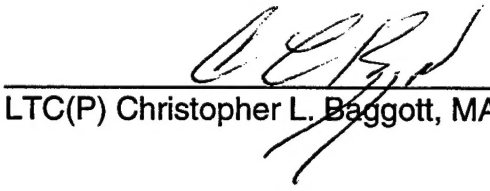

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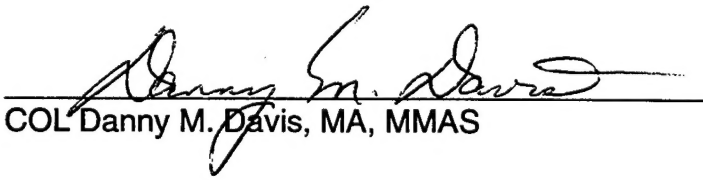

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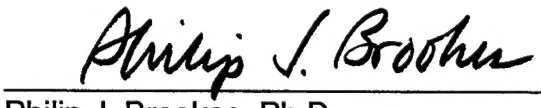

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Chapter One: Introduction

How do you "fix" a problem that never seems to get "fixed"? The U.S. Army, over the past ten years, has enhanced the ability of heavy brigades to conduct offensive reconnaissance operations, yet brigades have not significantly attained a higher rate of success.[1] Success is defined as the commander receiving the intelligence he requires in time to make and execute operational decisions.[2] Systems theorists have developed a technique called "systems thinking" to gain perspective on such difficult problems. Systems thinking is looking at the whole instead of the part. "It is a framework for seeing interrelationships rather than things, for seeing patterns or change rather than static 'snapshots'."[3] This monograph will determine if systems thinking, relative to offensive reconnaissance, "...is usually the best way to find out what is going on."[4] It will examine doctrine and develop a theoretical systems model to analyze how the Army has attempted to solve the reconnaissance problem.

Reconnaissance of the enemy and the terrain is not new to the art and science of war. Sun Tzu, a Chinese general, wrote in the 4th century B.C., "Thus it is said that one who knows the enemy and knows himself will not be endangered in a hundred engagements. One who does not know the enemy but knows himself will sometimes be victorious, sometimes meet with defeat. One who knows neither the enemy nor himself will invariably be defeated in every engagement."[5] Although SunTzu's frame of reference was ancient Chinese warfare, the same principle applies today. More recently, this lesson once again came into view at the U.S. Army's National Training Center (NTC).

The Army began conducting realistic, near combat-like battles for it's heavy forces at the NTC in 1981.[6] The NTC is located in the middle of the Mojave Desert at Fort Irwin, California. A typical training rotation consists of 7 to 10 battles conducted over a two week time span. The pace of these operations is relentless. Leaders quickly learn, as they would in combat, that they can not do everything themselves. Teamwork and initiative at the lowest level are keys to success. Short of actual combat, a NTC training rotation is the closest a unit will get pushed to it's limit. The hectic pace of operations and the constant pressure of fighting in a time constrained environment creates stress, fatigue and anxiety among the leaders and soldiers. What the training center can not replicate is the psychological impact of actual combat. About a third of the battles are live fire against wooden target silhouettes of enemy vehicles in tactical arrays, and the remainder, force-on-force.

These force-on-force battles pit heavy tank and infantry battalions (the Bluefor) against a formidable, permanent opposing force (the Opfor). The soldiers, vehicles, and weapons of both sides are equipped with a laser-based system (multiple integrated laser system or MILES) to simulate the effects of direct and indirect fire. MILES provides a method of objectively replicating the results of battlefield engagements that had not been possible before. For example, if a tank crew fired it's main gun at an Opfor vehicle, a weapons signature simulator is fired (smoke and a loud blast) and an invisible laser beam is projected to the target. If the laser beam hit the target, then the vehicle is either "destroyed or disabled" and the crew becomes "casualties."[7] The unit has to react to their "damaged equipment and casualties" as they would in combat. It was in this semi-

realistic training environment that battlefield observers began to see a systemic trend in the lack of reconnaissance information the Bluefor obtained prior to an attack.

BG Edwin S. Leland Jr., the commander of the NTC in the mid-80s, wrote, "The importance of reconnaissance cannot be overemphasized. There is typically a battle which precedes the battle -- a confrontation of opposing reconnaissance units -- and the winner of that preliminary battle is most often the victor in the main event."[8] Over the past 10 years various other studies have come to similar conclusions.

This monograph will examine four heavy force reconnaissance studies conducted over the past decade.

> **Study One**: U.S. Army Training Board White Paper on Enhancement of Reconnaissance and Counterreconnaissacne Techniques, 10 June 1986
> **Study Two**: U.S. Army Armor School Assessment of Reconnaissance and Counterreconnaissance at the NTC, February 1987
> **Study Three**: Rand Study, Applying the NTC Experience: Tactical Reconnaissance, October 1987
> **Study Four**: Rand Study, Battalion Reconnaissance Operations at the NTC, 1996

The first three studies looked at reconnaissance operations from various scopes and perspectives and tended to build upon one another. The earlier study's analyses were often quoted in later studies creating building blocks of thought. Many of the recommendations of these three studies were implemented by the early 90s. Unfortunately, the problem with reconnaissance operations was not solved.[9] This was determined by the most recent study in 1996.

This monograph will examine systems thinking to theoretically help determine if there is a primary cause of this seemingly unfixable problem. First, the monograph will explain current U.S. Army doctrine of heavy brigade reconnaissance operations. Next, the monograph will explain the scope, recommendations, and conclusions of the

reconnaissance studies. After the discussion of doctrine and the reconnaissance studies, the monograph will explain contemporary systems thinking. Next, the monograph will synthesize the various common theories of systems thinking. Some key theoretical systems points to emphasize are concepts of complex-adaptive systems, negative feedback loops and their delays, and indicator and critical variables. From these ideas, the monograph will develop a theoretical systems model based on the environment in which reconnaissance operations would actually exist. The monograph will then use this theoretical systems model to analyze the reconnaissance studies to determine if there is a root cause to the reconnaissance problem.

This monograph is based on two key assumptions. The first is that the reconnaissance studies reflect the U.S. Army's methodology, analysis, conclusions and recommendations of heavy brigade operations over the past decade. Obviously, it is impossible to capture all the thoughts and ideas of all the leaders and organizations concerned with reconnaissance operations. The assumption is that these studies represent the evolution of thought on reconnaissance operations for the U.S. Army. The second assumption is that the theoretical systems model this monograph will develop is accurate in its depiction of these operations.

The significance of this monograph is that if systems thinking can determine an underlying problem to reconnaissance operations, and reconnaissance operations are key to the success of offensive operations, then solutions to the negative trends of reconnaissance operations will enable the Army to improve their offensive operations. This monograph will look beyond the reconnaissance trends of the NTC to see if

reconnaissance is part of a complex system problem. A complex system consists of many interrelated variables such that action on one variable will always affect the system as a whole.[10] According to Dietrich Dorner, a professor at the University of Bamberg, "When correcting a deficiency it is usually wise to consider it within the context of the system. If we don't, we may treat only the symptoms and not the source of the trouble."[11] This monograph will conduct a systems investigation to identify the source of the reconnaissance operations problem.

Chapter Two: Doctrine

The purpose for examining doctrine is to provide background to facilitate the understanding of offensive reconnaissance operations and not to critique or analyze. This doctrinal understanding of reconnaissance will start from a broad explanation and focus to the specific. The broad understanding will address the significance of doctrine and explain the organization of a heavy brigade and how the commander obtains his information needs. With this information as background, this doctrinal understanding will focus specifically on brigade offensive reconnaissance operations. This focus will highlight the capabilities and limitations of reconnaissance operations, the requirement for a reconnaissance objective, and forms and methods of reconnaissance. Finally, an overall summary of the doctrine will highlight doctrinal considerations to put the reconnaissance studies into perspective.

Before explaining the specifics of heavy brigade offensive reconnaissance doctrine, it is important to understand what doctrine is. FM 100-5, Operations, the Army's keystone doctrinal warfighting manual defines doctrine, "As an authoritative

statement, doctrine must be definitive enough to guide specific operations, yet remain adaptable enough to address diverse and varied situations worldwide.[12] The key words are that doctrine is a "guide", "adaptable" and "situational."

To use an analogy, if you read a book about the doctrine of football, it may provide general guidelines about how the game is played. What this book could not do is address how to specifically play a game, on a given weekend, with two opponents. What the writers of a football doctrinal book could not know is the current status of your team, your opponent's team, and the weather and field conditions. Doctrine may not be able to provide a coach with the game plan, but it enables a team, consisting of coaches and players of different backgrounds, to have a common understanding of how the game is played. Imagine trying to play football, if no one understood how the game was played.

Conceptually, understanding doctrine relative to football is similar to how it pertains to brigade offensive reconnaissance operations. Reconnaissance doctrine addresses how to generally conduct these operations, but does not provide the details of a "game plan." Like the coach, the commander must adapt to the current situation. Just as a writer developing the doctrine of football might begin his "authoritative principles" with what a football team is and how it is organized, a doctrinal understanding of reconnaissance operations begins with similar information on the brigade combat team.

A brigade is a combined arms team consisting of three to four maneuver battalions habitually supported by artillery, engineer, and logistic assets. Additionally, it can be augmented with smaller units of military police, air defense, aviation, military intelligence, signal, chemical detection and reconnaissance, as well as an Air Force close

air support liaison team. A brigade can conduct independent offensive and defensive missions, but normally fights as part of a division. A "heavy" brigade consists of armored and mechanized infantry maneuver battalions.

As the football coaching staff supports the head coach by orchestrating the various players into an integrated team striving for a common goal, the brigade headquarters supports the brigade commander by integrating the units into a combined arms team. Unlike the head football coach, the brigade commander's concept is linked to his higher headquarters "game plan." Within the framework of this higher plan, the brigade commander establishes his intent and concept to guide his team. The football coach, during actual playing of the game, will adjust his game plan based on what plays are working, player performance and injury, and in reaction to moves of the opposition. The brigade commander will make adjustment for similar reasons during mission execution. Both the coach and the commander require information to support decision making during planning and execution.

For the brigade commander, this focusing of information requirements is called commander's critical information requirements (CCIR). CCIR consists of three separate categories of information that the commander needs to know to enable him to make decisions about the employment of his forces.

The first category of CCIR is the information the commander needs to know about the enemy and terrain. Since he has only limited time and assets to collect the necessary information, he focuses his team's efforts by identifying the most important. GEN Franks, the VII Corps commander during Desert Storm and a former commander of

the Training and Doctrine Command (TRADOC) stated, "Commanders must focus intelligence. They must decide what they need to know for the operation to succeed. This includes establishing clear priorities for intelligence and targets. My goal was to limit my questions to six." [13] This focusing of information about the enemy and terrain is called priority intelligence requirements (PIR).

The second category is information he wants to deny the enemy from obtaining about his forces. Football coaches sometimes close their practices to deny possible scouts from the opposing team the opportunity to observe the development of a new play. A commander might want to deny the enemy the location of his reserve force, because the enemy might attempt to deny the reserves use or limit its effect. This denial of critical friendly information to the enemy is called essential elements of friendly information (EEFI).

The third category consists of information he wants to know about his unit or adjacent units. If the quarterback's arm has been hurting through out the week, the coach is going to want constant updates to decide if he should play another quarterback or adjust his play selection. A commander might want to know if an adjacent unit has seized its objective which supports his unit's mission. This information is called friendly force information requirements (FFIR). EEFI and FFIR information concern friendly forces. PIR is information that the commander must use assets to seek out.

This seeking out of information about the enemy and the terrain is know as reconnaissance.

> **Reconnaissance**: "A mission undertaken to obtain information by visual observation, or other detection methods, about activities and resources of an enemy, or about meteorologic, hydrographic, or geographic characteristics of a particular area. Reconnaissance is a focused collection effort. It is performed before, during, and after other operations to provide information used by the commander to confirm or modify his course of action"[14]

Reconnaissance, therefore by doctrinal definition does not specify what asset obtains the information, but that it can be obtained from visual or "other detection methods." The brigade will develop a reconnaissance and surveillance plan that will integrate the various reconnaissance assets to answer his PIRs. The commander and staff conduct a METT-T analysis to understand the capabilities and limitations of their reconnaissance assets. METT-T stands for mission, enemy, troops, terrain, and time. Based on the METT-T analysis and CCIR, the commander will further focus his reconnaissance assets by "specifying the most important result to be obtained by the reconnaissance effort."[15] This focusing of assets is called the reconnaissance objective..

The reconnaissance objective can be enemy, force or terrain oriented. Every reconnaissance mission must have a reconnaissance objective.[16] The utility of specifying a reconnaissance objective is that it enables initiative for reconnaissance leaders on an ever changing battlefield. For example, the plan for a scout platoon could be to conduct an assortment of tasks during their mission. These tasks could be to check the serviceability of a bridge, the trafficability of multiple routes, and the identity of the enemy at a certain location. Due to inherent friction and limited time, the scout platoon leader might not identify the enemy task, but was able to check the bridge and the routes. If the platoon leader understood the reconnaissance objective was the identification of the

enemy force, then he could have prioritized his effort. Additionally, if the enemy was not at the specific location given, the platoon leader could take the initiative and identify the enemy by investigating vehicle smoke signatures he saw over the next terrain feature. Specifying the reconnaissance objective empowers subordinates to focus on that piece of information, above all else, that the commander needs to know to support his decision making. This focusing of efforts is important because the commander has a limited amount of reconnaissance assets to achieve his information needs.

The brigade headquarters does not have organic reconnaissance assets.[17] It must rely on obtaining information from subordinate and higher headquarters to answer it's PIRs. Only a parent unit can task reconnaissance assets. This means that the brigade will task a battalion, not an asset, to observe a named area of interest (NAI). A NAI is "an area on the ground which, when observed, will either confirm or deny an enemy course of action."[18] The battalion will determine, of its internal assets, what specifically to task to observe the NAI. If the brigade's subordinate units are unable or not capable of answering the all the PIRs, then the brigade will send request to higher headquarters for assistance. According to FM 34-8, The Combat Commander's Handbook on Intelligence, "No echelon has all the intelligence assets it needs to satisfy all the requirements of its commander."[19] Therefore, integration of the various echelons of intelligence assets is vital to obtain the commander's PIRs. The various echelons can contain ground, air, and technical reconnaissance assets. "Acting in concert, these assets create a synergism, using the strengths of one system to overcome the weakness of another."[20]

"Ground reconnaissance assets are generally limited in depth to which they can conduct reconnaissance. However, they can operate under weather conditions that prohibit air reconnaissance operations."[21] The primary means for ground reconnaissance available to the brigade are the battalion scout platoons (see reference for capabilities).[22]

In addition to the battalion scout platoons, the brigade has many other assets which may be organized to conduct ground reconnaissance. The division could attach a cavalry troop to the brigade for a given mission (see reference for capabilities).[23]The direct support artillery battalion has combat observation lasing teams (COLTs) that often accompany battalion scouts and are well equipped for directing indirect fires. Engineer platoons can provide expertise on obstacle identification and breaching. Air defense artillery (ADA) scouts from an attached ADA battery are often sent forward for enemy air early warning. The military police platoon is trained to conduct route reconnaissance. The division chemical company has a chemical reconnaissance platoon equipped to identify and mark contaminated areas. Finally, all brigade ground units have an implied task of answering the commander's PIRs within their capability. Reconnaissance is not limited to assets on the ground.

"Air reconnaissance complements ground reconnaissance by greatly extending the area that can be examined in a given period. These assets operate at a considerable depth, far in advance of the normal capability of ground elements."[24] Scout and attack helicopter units of the division aviation brigade may be placed in operational control (OPCON) to the brigade to accomplish a mission or for the duration of an operation.[25] The brigade air liaison officer (ALO) is the brigade's link to Air Force close air support (CAS). The ALO

can receive in-flight information from aircraft, especially on enemy ADA dispositions. Many of the air assets, like ground assets, employ the forms and methods of reconnaissance to achieve their reconnaissance objective.

The forms of reconnaissance are analogous to the various types of plays a football team can execute to achieve their goal. Passing and running are among the types of plays a football team can execute. The forms of reconnaissance are route, area, zone, and reconnaissance in force.

> **Route Recon**: "A directed effort to obtain detailed information of a specified route and all terrain from which the enemy could influence movement along that route."[26]
> **Area Recon**: "A directed effort to obtain detailed information concerning the terrain or enemy activity within a prescribed area."[27]
> **Zone Recon**: "A directed effort to obtain detailed information concerning all routes, obstacles, terrain, and enemy forces within a zone defined by boundaries. The commander, through his intent, may focus the recon on the enemy, the terrain, or a combination of the two. This mission is a deliberate, time-consuming process and takes more time than any other recon mission"[28]
>
> **Reconnaissance in force:** "A limited objective operation by at least a battalion size force to obtain information and to locate and test enemy dispositions, strengths, and reactions.."[29]

What the forms of reconnaissance, like the types of football plays, do not do is focus the efforts those forces. Ordering a reconnaissance asset to conduct a zone recon is like ordering a football team to execute a pass. A football team needs the specific passing play the coach wants achieved. The commander uses the reconnaissance objective to focus these forms of reconnaissance.

The forms of reconnaissance are executed by ground and air assets using two contrasting methods.

> **Reconnaissance by stealth**: "Avoids physical contact with the enemy and gathers information by quiet, deliberate, dismounted techniques. Surveillance is the primary task performed (see reference for definition of surveillance)."[30]
> **Aggressive reconnaissance**: "Avoids decisive engagement but prepares to fight, especially enemy security and recon forces, to gain information."[31]

Brigades generally employ reconnaissance by stealth using their scout platoons and other assets. Cavalry units generally employ aggressive reconnaissance. In addition to ground and air assets which employ the forms and methods of reconnaissance to achieve the reconnaissance objective, there are assets which conduct reconnaissance using the electronic spectrum.

Technical reconnaissance relies on sophisticated instruments to acquire a target. An analogous civilian example of this type of technology are air traffic control towers. The air traffic controllers only see an electronic image of aircraft. Technical reconnaissance is provided by a number of units. "Military intelligence (MI) units provide intelligence and electronic warfare (IEW) support, such as electronic intercept and monitoring, ground surveillance radars, unmanned aerial vehicles (UAVs), remotely emplaced sensors, and human intelligence (HUMINT) collection through interrogation of captured enemy soldiers."[32] Though not their primary mission, field artillery, air defense, and signal units can provide the brigade technical reconnaissance information. The division artillery has fire finder radars that can detect enemy indirect fires (see reference for capabilities).[33] "Air defense target acquisition systems provide information on enemy air activity."[34] What ever assets the commander employs, there are limitations that restrict the amount and type of assets he can use.

The amount of reconnaissance assets a brigade can have in support depends largely on its priority within the division and time. If a brigade is the main effort it will probably receive more reconnaissance assets than if it were a supporting effort. Time is another limitation. Some information, such as scouts sending reports over the radio, is

near real-time, other information takes time to analyze. The more time the brigade has to prepare, the more information it generally can obtain.

Besides time, terrain and weather can limit the type of assets a brigade can employ. There are weather conditions that prohibit aerial reconnaissance, but not stop ground reconnaissance. There are terrain conditions that can limit or drastically slow down ground reconnaissance, but not stop aerial or technical reconnaissance. Terrain and weather can also positively and negatively effect enemy forces.

These enemy forces can limit the effects of friendly reconnaissance assets. The enemy forces conduct security operations to prevent friendly reconnaissance from obtaining information on enemy dispositions. If this enemy security operations force is strong and alert, it could severely limit the ability of friendly reconnaissance from obtaining their mission. Strong enemy ADA assets could limit the ability to use aerial reconnaissance. Enemy electronic warfare assets can degrade the ability of technical reconnaissance. Like friendly forces, the enemy will constantly adapt to impose their will.

Doctrine, although an "authoritative statement", requires constant adaptation to the environment. Like the football coach, the commander applies doctrine to his specific situation. There is one constant in reconnaissance doctrine that does not change. Doctrine clearly emphasizes the role and the judgment of the commander as the key to successful reconnaissance operations. If the commander is unable to properly focus his information requirements and orient his reconnaissance assets, the capabilities and limitations of his assets matter little. Like the football coach enhancing the passing game by having a strong running game, the commander can enhance the abilities of his reconnaissance

assets through their complementary employment. Like the football coach adapts his game plan throughout the contest, the commander must be able to adapt to changing situations.

The doctrine presented represents the Army's most current thought on reconnaissance operations. The reconnaissance studies were conducted with earlier doctrinal publications in effect. Their recommendations drove changes to that led to the current doctrine. Although these changes added emphasis, detail, and synergism among doctrinal publications pertaining to reconnaissance, the doctrinal importance of the commander to this process has not changed.

Chapter Three: Reconnaissance Studies Overview

This overview of selected reconnaissance studies represents a pattern and perspective of thought on the reconnaissance problem from a decade ago to the present. The purpose of examining the reconnaissance studies is to explain their scope. Scope means "extent or range of view, outlook, or understanding."[35] This monograph will highlight the major conclusions and recommendations, but is interested more in the study methodology these deductions derived from.

To use an analogy, if these reconnaissance studies were a scientific experiment, the hypothesis or research question, assumptions, and methodology behind the experiment is what will be examined. For example, what if researchers studied football offensive play and used Canadian football as their model and made conclusions and recommendations to apply to all football? The study would be flawed because conclusions about the Canadian model are not generalizable to American football. The Canadian game has a larger field, twelve as opposed to eleven players, and numerous

other rule differences. This reconnaissance studies overview will state what the researcher's models were and will begin with the oldest of the works.

The first study to be examined is the "U.S. Army Training Board White Paper on Enhancement of Reconnaissance and Counterreconnaissance Techniques," published 10 June 1986. The study researched the question, "Why reconnaissance and counter-reconnaissance at battalion task force level appear to be weak?"[36] The methodology for deriving their analysis was based on discussions with personnel from units, branch schools, NTC, and Fort Leavenworth.[37] An unstated assumption of this study is that observations from NTC training rotations of reconnaissance operations replicate the reality of the environment of war. The study's major conclusion was that battalion commanders were not knowledgeable enough to train and employ their reconnaissance assets (see reference for further conclusions).[38] The study's major recommendation was to specifically address this subject at the battalion commander's Precommand Course and that the scouts need more and better vehicles (see reference for other recommendations).[39] At the time of this study, the focus of training at the NTC was the battalion task force. The brigade headquarters was not a major player. A similar study to the Training Board's white paper was led by the Armor School in 1987.

The commander of the Combined Arms Center (CAC) declared NTC rotation 87-1 a "Special Focus Rotation" for reconnaissance. Based on this rotation, the Armor School published a report, "An Assessment of Reconnaissance and Counterreconnaissance at the NTC." To collect observations and analysts for this report, the Armor School led a Training and Doctrine Command (TRADOC) assessment team

consisting of members from the branch schools. Several team members were former NTC observer/controllers who could educate the other members on the unique NTC conditions of the training scenario which could distort reality (see reference for other key member).[40] The Rand Corporation, conducting a similar but separate study, shared their data and observations (examined next). In addition to observations at the NTC rotation, the team reviewed Take Home Packages from previous rotations (see reference).[41] Like the previous study, the team conducted extensive interviews.

This TRADOC team's purpose was to identify shortfalls in their doctrinal products related to the performance of reconnaissance and counterreconnaissance operations by heavy brigades and battalion task forces.[42] Like the Training Board study, an unstated assumption is that their observations from the NTC model replicate the environment of war. The TRADOC team's major conclusions were similar to the Training Boards. The inability of brigades and task forces to perform successful reconnaissance operations is attributable to shortfalls across the board - doctrine, training, organization, material, and NTC scenarios (see reference).[43]

Contrary to the TRADOC team's declared purpose, their report focused on the task force and virtually ignored the brigade. This could be attributed to, as mentioned earlier, that brigade headquarters were not a major part of the scenario at that time. The report failed to mention the brigade's doctrinal role in integrating the available assets of ground, air, and technical reconnaissance. A surprising observation related to this was the report stated that the brigade does not have organic reconnaissance capabilities and therefore is unable to provide their subordinate units with fresh information on the terrain

and the enemy.[44] Consequently, the report declares, effective reconnaissance is directly related to the time available for the scout platoon to "get the job done."[45]

Like the Training Board, the TRADOC team concluded the scouts need a new vehicle for to conduct effective reconnaissance. The Team stated, "TF scouts envy Opfor scouts who operate HMMWVs. In large measure, the HMMWV characteristics contribute to the renowned success of the Opfor reconnaissance elements."[46] This comment is indicative of a perspective developing in the Army at the time and foreshadows how the Army would later attempt to solve the reconnaissance problem. The Rand Corporation conducted a similar study to the Training Board's and the TRADOC team's, but had a much longer perspective and was more analytical.

The Rand Corporation's Arroyo Center conducted, of the reconnaissance studies examined, the most analytical and longest investigation in terms of time the reconnaissance problem (see reference for background on Arroyo Center).[47] The Rand report, "Applying the National Training Center Experience: Tactical Reconnaissance," examined seventeen task force rotations from 1985 to 1986. A total of 113 force-on-force battles were studied.[48] The study's purpose was to "...examine the importance of reconnaissance to the success in the offense, and to analyze the conduct of reconnaissance by training units."[49] The methodology was to have the observer/controllers record observations of reconnaissance operations on data cards and examine unit Take Home Packages of battalion task forces. The report's authors observed many of the battles personally, and conducted discussions with personnel at the NTC.[50] Unlike the previous studies, the Rand report conducted analysis of the data cards to derive their conclusions.

This study made a key assumption which appeared as a footnote in their report. The assumption was, "We know that some aspects of the training must of necessity distort reality. However, the conduct of reconnaissance and the intelligence function is generally considered to adequately replicate reality."[51]

The study obtained data to show that there is a strong correlation between successful attacks and successful reconnaissance (see reference for data).[52] An attack was rated a "success" by placing forces on the mission's terrain objective, the defender reduced to ineffectiveness, and the attacker retaining coherent combat power. Reconnaissance was rated successful if "information" was obtained and communicated to the task force. "Information" was defined as information of the enemy's defensive positions and obstacle system.[53] On the reconnaissance data card the observer/controllers specifically recorded, "Did recon pinpoint sufficient number of vehicle fighting positions and orientations and individual emplacements to permit the S2 to template dispositions down to at least platoon level."[54]

In addition to this correlation of successful reconnaissance to successful attacks, the Rand study's major conclusion was that greater emphasis should be placed on the reconnaissance function by task force commanders. They determined the root of the problem, as had the previous studies, as the lack of doctrinal emphasis in manuals and instruction.[55] The study emphasized the need to use all reconnaissance assets, not just scout platoons. Like the previous studies, Rand recommended the HMMWV be studied as a future reconnaissance vehicle (see reference for other recommendations).[56] The analysis of Rand and the other studies were used by Army assessment plans to drive

changes in the doctrine, training, organizations, equipment, and leader development (see reference on further information on assessment plans).[57]

Many of the recommendations of the reconnaissance studies and assessment plans were turned into "fixes" (see reference for list).[58] In 1993, a former commandant of the Armor School requested Rand to relook reconnaissance operations at the NTC. The purpose of this new study was to determine if the "fixes" the Army implemented "were successful in overcoming the former problems."[59] The new Rand study used similar methodology as their earlier study, but added the collection of data about the reconnaissance planning process by the task force. Rand studied 10 battalion task forces between 1993 and 1994, for a total of 41 battles.[60]An unstated assumption again viewed the NTC reconnaissance operations as adequately replicating reality.

Rand's new findings, "Battalion Reconnaissance Operations at the National Training Center", were published in 1996. The report's major conclusions were that scout platoons are better equipped and better able to accomplish their missions. Unfortunately, scout survivability remains a critical problem. The study concluded the greatest problem remains with the battle staff operations. The report stated that coordination of reconnaissance assets at brigade and battalion was often incomplete.[61] The study recommended "either a new vehicle, or mix of vehicles, plus changes in the doctrine of employment are indicated." The report did not offer any specific new solutions.[62]

This inability to solve the reconnaissance problem, as covered in Rand's 1996 report, led the Armor School to host a Reconnaissance Symposium in October of 1996. The conference identified that units consistently fight without enemy awareness, usually

fight the plan and not the enemy, are unable to react to enemy actions, lack confidence in reconnaissance and surveillance operations, and lose decisively. The root cause was poor reconnaissance and surveillance planning.[63]

Over the past decade, the Army has attempted to solve the reconnaissance problem. In the process the Army has implemented many of the recommendations of the studies and assessments, but the reconnaissance problem remains. These works have greatly contributed to the understanding of these operations. Now that the Army is focusing on the brigade and battalion reconnaissance and surveillance planning, a solution, it logically follows, should not be far away. Or is it?

Is there something more to the reconnaissance problem than meets the eye? Peter Senge, a professor at MIT's Center for Organization Learning, stated, "Structures of which we are unaware hold us prisoner. Once we can see them and name them they no longer have the same hold on us."[64] Are there "structures" to the reconnaissance studies that has inhibited the Army from solving the reconnaissance problem?

Chapter Four: Systems Thinking

The development of the theoretical systems model will begin with a theory of the environment of war. Theory is the relationship of ideas to clarify concepts. As explaining the purpose of doctrine was important for understanding reconnaissance doctrine, the explanation of the purpose of theory is important for understanding theory. "Theory ... is like a blueprint, which shows us how something works."[65] This blueprint or theory is universal and is then shaped into specific doctrines which armies will practice.[66] The

paper this blueprint of the theoretical model is drawn on is the environment of war. The environment of war consists of two domains: the physical and the moral.

The physical domain is concerned with the physical factors. For war these are the weather, terrain, equipment, vehicles, aircraft, munitions, weapons, logistics and so on. A commander needs to understand the physical capabilities of his reconnaissance assets in relation to the terrain, weather, and enemy physical capabilities. Clausewitz stated, "Military activity is never directed against material force alone; it is always aimed simultaneously at the moral forces which give it life, and the two cannot be separated."[67]The moral domain contains the human aspect.

The moral domain is the effect of the physical environment on the mind of the soldiers. Webster's defines moral as "acting on the mind, feelings, will, or character."[68] Based on stimulus from the physical domain, the mind rules what action the body will take. Therefore, the moral domain is dominate over the physical domain. The dominance of the moral domain in this relationship was not lost to Napoleon in his famous maxim, "The moral is to the physical as three is to one. (The monograph used this ratio for its model, Figure 5: The Environment of War)"[69] To Napoleon, "Moral force, rather than numbers, decides victory."[70] The commander needs to understand how the moral forces affect his soldiers and himself. General Wavell, a British commander in World War I and II, recalled that during his course at the British Staff College at Camberely (1909-1910) insufficient stress was laid "on the morale, or how to induce it and maintain it.[71]

A soldier's mind is governed by an environment where the moral forces dominate over the physical. In combat, a soldier's mind exist at a state of near moral disintegration

because of the disablers of danger, fear, confusion, stress, and fatigue of combat. E.B. Sledge, a Marine rifleman in World War II who fought in the bloody Pacific battles of Peleliu and Okinawa, wrote that with soldiers "...fear is not just of being killed or wounded, it is fear of something worse - fear of not being able to take it and exhibiting symptoms of cowardice to an audience of men who have trusted you."[72]

A soldier's will is enabled by his value system, cohesion, discipline, collective training, motivation, compassion, and persistence in chaos. Trust and confidence in his leaders are also enablers. Michael Doubler writes, "The best officers did not order or ask men to expose themselves needlessly or to attack in the face of overwhelming odds. Troops desired self-control and emotional stability in their leaders."[73] Death of a leader can have a devastating impact on the unit. Sledge writes, losing a leader "...was like losing a parent we depended on for security - not our physical security, because we knew that was a commodity beyond our reach in combat, but our mental security."[74]

The commander is governed psychologically by his value system when he sends forces in harms way. "Values are attitudes about the worth or importance of people, concepts, or things. Values influence your behavior because you use them to decide between alternatives. ...What you value the most will guide your actions."[75] They are torn between the safety of their men and the accomplishment of the mission. What sustains commanders is their character, self discipline, self preparation, and persistence during decision making.[76]. What is vitally important is for commanders to enable the moral forces of their soldiers and disable the moral forces of the enemy.[77] E.B. Sledge's

company commander understood this concept of enabling friendly and disabling enemy moral forces at Peleliu.

> After a hard day of bloody fighting on the small, Pacific Island of Peleliu, Sledge's company settled down for some rest for the night. Even with a lull in the action, tension for the Marines was high. The Japanese were prone to infiltrate Marine units and slit Marine throats. Sledge was in his fox hole and observed his company commander calling for artillery fire. There were no identified enemy targets, and battalion was questioning the need for his request. The company commander, "answered (the radio call from battalion) pleasantly and firmly, 'Maybe so (that the rounds were tactically unnecessary), but I want my boys to feel secure.' Shortly the 75s (the artillery rounds) came whining overhead and started bursting in the dark thick growth across the road... 'That's the skipper for you, always thinking of the troops feelings,' one of the men observed."[78]

Sledge's company commander's request for artillery was not part of a formal plan or scheme of artillery fires. The artillery may not have destroyed a target, but it enabled the moral forces of his men. The opposite effect, quite possibly, could have occurred in the minds of the enemy soldiers receiving the artillery fire.

The environment of war is not a perfect world (see Figure 1). It is a world where friction is constant and the fog of war "the obstruction of reality."[79] Even with perfect

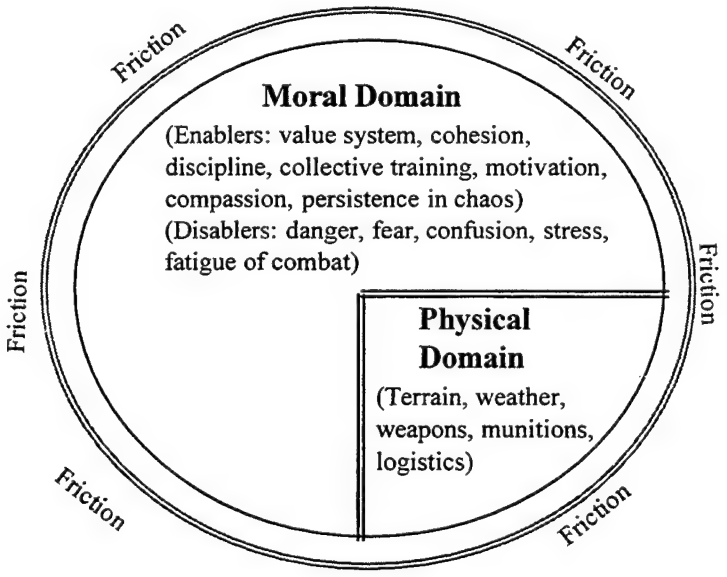

Figure 1: The Environment of War

planning and proper utilization of reconnaissance assets, the unexpected will happen. For example, vehicles will break down, soldiers will get lost, and orders can get misinterpreted. The clash of wills of the opposing forces creates more friction. The environment of war exists in the context of a system. System theorist can offer perspective on how this system works.

"A System is a collection of parts which interact with each other to function as a whole."[80] Systems theory had its beginnings in the 1920s when a group of researchers observed that different systems follow the same general rules of organization.[81] Systems from hard sciences followed the same general rules of social science. Dr. M. Mitchell Waldrop, a member of a think tank called the Santa Fe Institute, believes there are "complex adaptive systems."

Complexity is a term to describe the functioning of systems made up of "a great many agents interacting with each other in a great many ways."[82] In this type of system, the agents will constantly self-organize and adapt to new events. In a complex adaptive system there is no head agent. Waldrop uses the example that in chemistry there is no head molecule. A complex adaptive system never reaches equilibrium, it is always in transition because the agents constantly adapt off one another. Each agent will try to turn whatever happens to their advantage.[83]

By Waldrop's definition, a football game could be classified as a complex system. The players and the coaches of the opposing teams are "the agents interacting" and adapting off one another. A football game may be a complex system, but it is not a complex adaptive system because there is a head agent. Although the teams adapt off

each other's plays, the referees are empowered by the league to enforce a set of rules. On the surface there is interactive play, but the game is controlled by a higher authority than the teams. Waldrop's complex adaptive system concept works better when it is applied to the environment of war (see figure 2). In war there is no head agent over the opposing military forces. Both sides exist in the environment defined by the physical and moral domain and experience friction. Both sides constantly adapt to achieve an advantage over

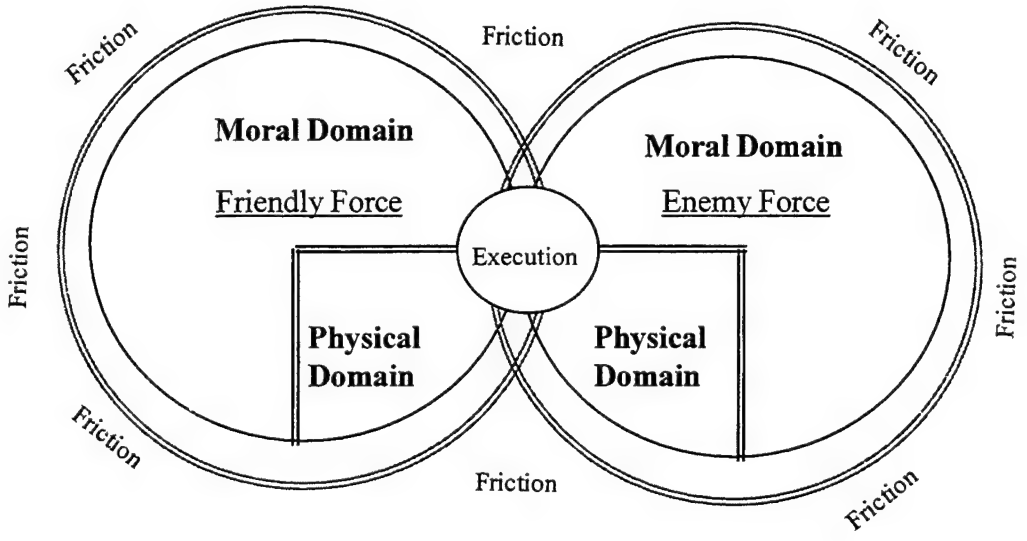

Figure 2: Complex Adaptive System

the other. With the environment of war identified in terms of a system, and if reconnaissance operations occur within this system, then systems thinking can offer "structural explanations" on the reconnaissance problem that are not apparent.

Key in understanding "structural explanations" of problems is the restructuring of how we think. Peter Senge believes our language shapes our perceptions. "What we see depends on what we are prepared to see. Western languages, with their subject-verb-object structure, are biased toward a linear view. If we want to see system wide interrelationships, we need a language of interrelationships, a language of circles."[84]

Senge believes that it is better to use systemic language rather than linear language. With systemic language the mind is subtly trained to structure data in circles instead of straight lines.

Seeing circles is the feedback process of cybernetics. There is a delay between the action and the feedback of the consequences of the action. Cybernetics is a theory of control systems based on communication of information in an environment.[85] It is based on "...the principle of feedback providing mechanisms for goal-seeking and self-controlling behavior."[86] For example, a soldier's brain sends the message to the body to use binoculars to observe enemy forces (see figure 3).

Figure 3: Message is sent

The message is sent and the soldier's brain begins to receive feedback from his observation of the enemy (see figure 4). The feedback of this observation causes the soldier to communicate this information to his unit and continue to observe, creating a circular pattern.

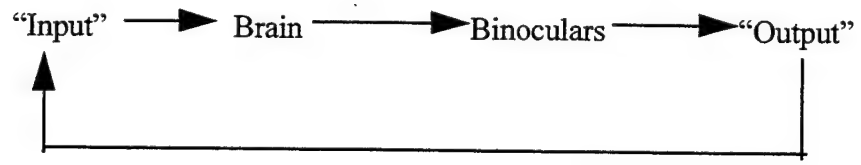

Figure 4: Negative Feedback Loop

What if the soldier is observed by the enemy? Then his feedback has an entirely different effect. The "negative" in the "negative feedback loop" means to negate. The soldier's mind negates the effect of fire by experiencing an emotion which will cause him to react.

The soldier experience's fear, danger, and stress. This feedback to his brain causes the, "...violent pounding of the heart, sinking feeling in the stomach, shaking or trembling of the hands and body, cold sweat and nausea."[87] The soldier will adapt to this feedback for self preservation. Negative feedback offers stability to the system.[88] The soldier might seek cover, fire his weapon, withdraw, seek help, or do nothing. When the soldier decides on a new action, a new message is sent to his body and a feedback returns. Negative feedback is not the only way to receive the effects of a message. Positive feedback can occur before a message is sent (see figure 5).

Positive feedback is the opposite of negative feedback. Negative feedback "corrects" changes to the system. The reaction of the soldier to preserve his life is negative feedback. Positive feedback "adds" to change.[89] The soldier can experience positive feedback even before he begins his mission. He might have heard a rumor that a unit to his front got overrun. His fears are "amplified" by such information. The sight of soldiers running to the rear, a loud noise all can have an explosive quality if not checked.

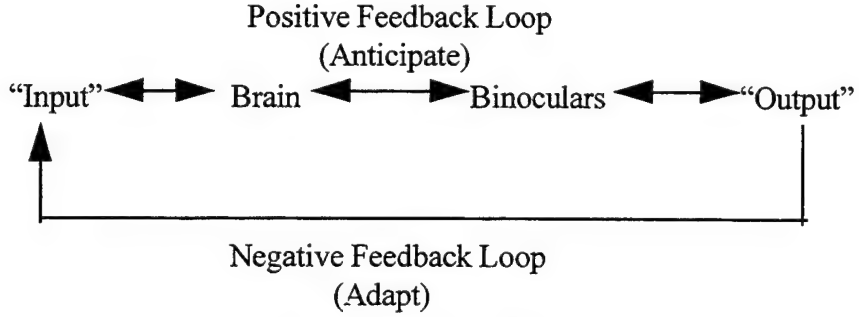

Figure 5: Positive Feedback

The system in these examples was the soldier. The negative feedback to the soldier of fear and danger was instantaneous. What if there was a ten minute delay from time of a soldier was fired on, to the time his mind received feedback of fear and danger?

There is a good chance the soldier would be killed because his mind would have recognized the danger too late. Another example is if there was a ten minute delay from the time you adjusted the water faucet to the time the water temperature reached the desired temperature. If you did not understand the delay you could constantly readjust and overshoot the desired temperature. The big payoff in improving systems performance is by minimizing delays.[90] It is the judgment of the human actor which recognizes these delays. Therefore in systems thinking, "the human actor is part of the feedback process, not standing apart from it. This represents a profound shift in awareness."[91]

What is the human connection of the reconnaissance problem? Identifying this human connection which can affect the delays is critical. The "indicator and critical variables" of the system must be identified.

> **Indicator variables**: "Those that depend on many other variables in the system but that themselves exert very little influence on the system. They provide important clues that help us assess the overall status of a system."[92]
> **Critical variables**: "Those that interact mutually with a large number of variables in a system. They are then the key variables: if we alter them we exert a major influence on the status of the entire system."[93]

The reconnaissance problem is the result of the inability to provide the commander the information he needs to make decisions about the employment of his forces. Reconnaissance assets are an indicator variable. A scout platoon, for example, depends on many other variables within the system. The success of the scout platoon can offer a status of how the system is working as a whole. The critical variable is the commander. It is this human actor that interacts with a large number of variables. If the ability of the commander is altered, then it effects the entire system. A scout platoon may have the best trained soldiers and best equipment in the world, but it matters little if it is not focused on

the right reconnaissance objective. The commander is the human actor which responds in the cybernetic system of feedbacks and delays (see figure 6).

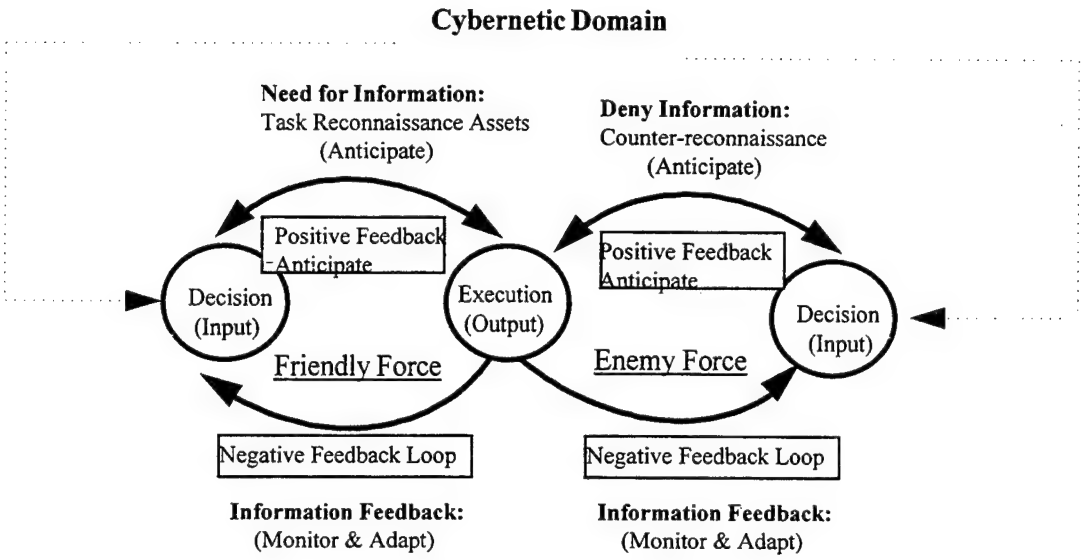

Figure 6: Cybernetic Domain

The commander influences the feedback of the system using the tools of command, control, communication, computers, and intelligence (C4I, see reference for definition).[94] This cybernetic process is the domain the commander uses to operate in the environment of war. The commander focuses his information needs with his CCIR, specifically the PIRs and orients his reconnaissance assets with reconnaissance objectives. The execution circle represents the reconnaissance forces executing their mission. These assets obtain information and send it back to their unit. This is called the negative feedback loop. The large amount of information from the reconnaissance assets is screened by the staff using CCIR as a filter. Through the CCIR filter the PIRs emerge for the commander to support his decision making. This new information will drive the commander to need other information, to adapt, so the circle is continuous. In a perfect world, this is how the system should work. A similar system, represented by the circle on

the right, is used by the enemy. Unfortunately, not all the information coming back on the feedback loop will be good. Some of this information will be the gut-wrenching painful knowledge of soldiers wounded and dying. This cybernetic command system exists in the complex-adaptive environment of war (see figure 7).

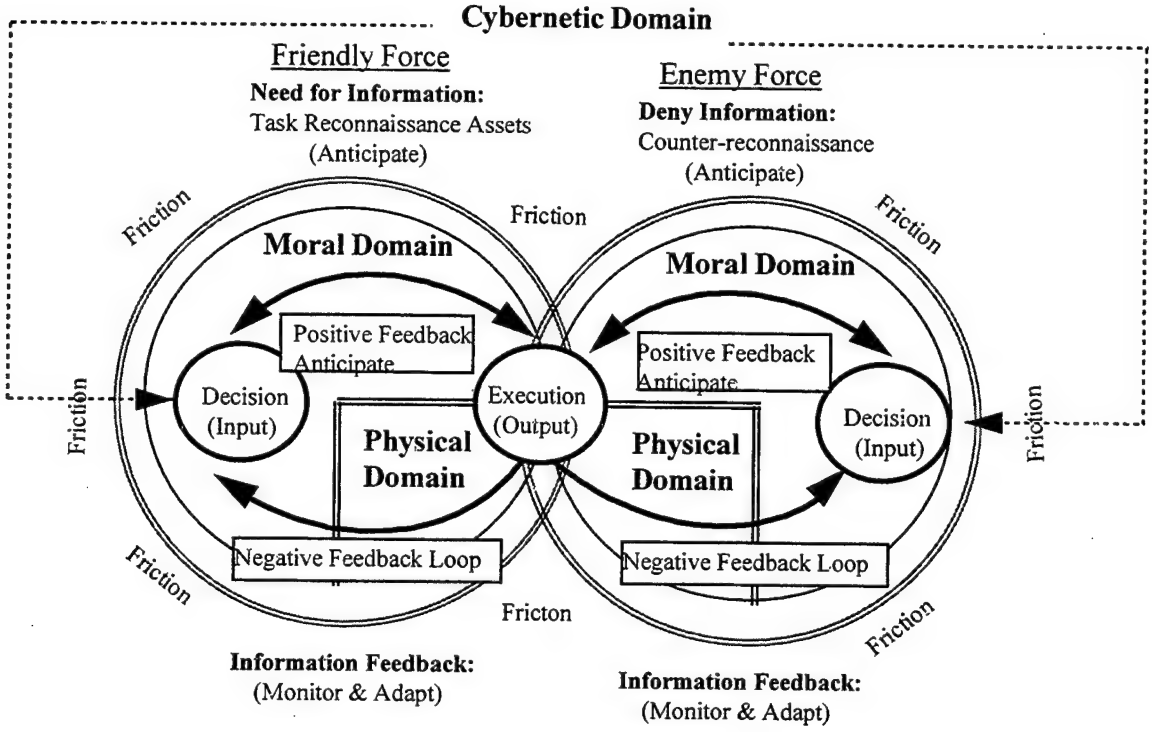

Figure 7: Complex-Adaptive Command System

What should appear strange about the theoretical systems model is that it is not a reconnaissance model. The theoretical model is a "complex adaptive command system." The goal of a properly functioning command system is to gather information accurately, continuously, selectively, and faster than their opposition in order to support their decision making.[95] Each side will try to impose their will on the other. Each side will try to prevent the other from obtaining information on their forces. No one is in charge or controls the events of the environment. Each side will constantly adjust off the other and

adapt to take advantage of events. The key to the reconnaissance problem is understanding how the commander, as the critical variable, can operate in this environment.

The command system must be able to anticipate uncertainty and adapt to it when it occurs. S.L.A. Marshall stated in his famous book, Men Against Fire, that "...by a rough approximation: 60% of the art of command is the ability to anticipate; 40% of the art of command is the ability to improvise, to reject the preconceived idea that has been tested and proved wrong in the crucible of operations, and to rule by action instead of acting by rules."[96]

Prior to sending his reconnaissance assets out on their missions, the commander and staff conduct a METT-T analysis. They need to understand the capabilities and limitations of each of their assets and employ them in a complementary manner. The strength of one can make up for the weakness of another. The analysis needs not to be only of the physical capabilities of the assets, but the moral as well. When the reconnaissance forces, the indicator variables, suffer losses the commander must adapt to the new situation and anticipate the next employment of these forces. Thus, the never ending circle in the model, whether anticipating the employment of reconnaissance forces or adapting to the feedback of their mission execution.

The theoretical complex adaptive command system model is based on the commander, as the critical variable, interacting and influencing the system. The reconnaissance assets, as the indicator variables, will be at various states of physical and moral readiness. Lessening the delay of the information the commander needs is vital.

The enemy will try to increase this delay. The commander can positively influence the moral as well as the physical domains of his forces. S.L.A. Marshall writes, "...I have witnessed units which had been badly bruised, and then bound back almost at once when given a little intelligent moral treatment by a superior."[97] The commander must anticipate and adapt in an environment of constant friction and in which the moral forces dominate. The enemy commander, in this complex adaptive system, will be doing the same thing. The better the commander can anticipate and the quicker he can adapt, the faster the information from the reconnaissance assets can be used to support his decisionmaking.

Chapter Five: Reconnaissance Studies Analysis

The reconnaissance studies had similar focus, assumptions, limitations, conclusions, and recommendations (see appendix I). The first three studies' recommendations were largely implemented by the Army by the early 90s. A common conclusion was the lack of reconnaissance operational knowledge and/or emphasis by task force commanders and that the scout platoon organization was too small and needed a more stealthier vehicle. The major recommendations addressed these conclusions. The fourth study concluded that the "fixes" the Army implemented have not solved the reconnaissance problem. Scout platoons have improved, but they still suffer heavy casualties and the task force staff's need improvement in reconnaissance and surveillance planning. Is there a "structure" that these studies were unaware of that is preventing a "fix" to the reconnaissance problem? The mental model of the reconnaissance studies was the NTC training environment (see appendix A, assumptions). Mental models are ingrained assumptions of how we perceive an event.[98] The analysis will begin with

reconstructing reconnaissance studies mental model to detect if there is such a hidden "structure" and will follow the method used to develop the theoretical systems model. The reconstruction will begin with examining the environment of war.

The environment of war is much different than the environment of the training at the NTC. The physical domain is similar except for the effect of munitions on soldiers. The difference of the physical munitions effect has a profound effect on the moral domain. The tough NTC training scenario causes stress, confusion, and fatigue. What the NTC environment can not simulate is the degree of danger, fear, and stress of the true environment of war. "Casualties" at the NTC may cause anxiety and disappointment in the leaders and soldiers, but they do not have the traumatic psychological impact of true combat. A ringing sensor on a soldiers MILES harness is the signal that he is a casualty. A MILES casualty card will specify what "wound" he has and how quickly he must be evacuated. In combat, a casualty might be killed or missing an arm, leg, or part of his face and screaming in pain. This difference in environments is to be expected. The key is if this difference effects the derived observations and conclusions.

The environment of war exists in a complex-adaptive system in which no one is in charge. The NTC training environment is complex , but it is not a complex-adaptive system. It is complex in that there are many interacting agents, but it is not a complex-adaptive system because there is a controlling authority over both sides. The Bluefor and the Opfor adapt off each other to achieve advantages, but this action occurs within a prescribed rules of engagement and the parameters of the training scenario. At anytime, the training scenario may be influenced by the commander of Operations Group (the head

observer/controller training the brigade), the NTC commander or the division commander of the bluefor brigade.

The training scenario's focus, during the time of the studies, was battalion/task force level operations. The brigade had a limited role. It is not surprising that the "fixes" tended to focus on the unit commander's ability to employ the scout platoons and improving the organization, training, and equipment of scout platoons. The Rand studies did observe that there was a problem with units integrating all the reconnaissance assets. A problem that went unobserved is the ability of the brigade to integrate all the reconnaissance assets it would normally get in combat. Since the battalion scout platoons were the main reconnaissance asset in the training scenario, it was natural to focus on it as being central to the problem. Yet, how are the commanders at integrating the capabilities of ground, air, and technical reconnaissance? The reconnaissance studies do not have an answer for a problem that they did not see. The adaptations , in a complex-adaptive systems that exist in the environment of war, will be different than a complex system in the environment of training. These adaptations are caused by the cybernetic negative feedback generated by the outputs of the actions of the reconnaissance assets.

In a complex-adaptive system which exists in the environment of war, the positive and negative feedback loops would be profound. The anticipation that soldiers could be killed or wounded would be in the minds of the leaders conducting METT-T analysis prior to sending the reconnaissance assets on their missions. If values influence behavior when deciding between alternatives and if what you value the most guides your actions, then a high value on human life will have a profound effect on the employment of

reconnaissance forces. Positive feedback both good and bad will effect leaders and soldiers. Either the enabling or disabling moral forces can amplify the emotions of both sides before an action takes place. Rumors of danger, even if not true, can have a debilitating psychological effect and can rapidly spread if not controlled.

Leaders and soldiers will adapt to the negative feedback loops. If a scout HMMWV is destroyed and the soldiers incinerated inside, the negative feedback loops of the remaining scout teams will be of terror, fear, and sadness. These scout teams as well as the unit leadership will adapt to these feedback loops. They have to adapt in order to maintain stability. The quicker they can get this negative feedback message, the quicker they can control the adaptation, negate the effect of the message and consequently maintain stability in the system. The longer the delay in the negative feedback message, the harder it is to maintain control of the system.

In the NTC complex training environment, the positive and negative feedback loops will not replicate those of the complex-adaptive system. Since soldiers will not actually be dying, the psychological impact of the feedback will be different in a training environment. Both Rand studies observed that roughly half the scouts are killed each mission.[99] In combat, according to a study by Anthony Kellett called Combat Motivation, if one-third of a fighting force suffers casualties, the unit will be wrecked psychologically if the experience is repeated.[100] If the leader does not adapt to the feedback, then an increase in psychological casualties will force him to adapt. This is the systems way of maintaining stability. In a training environment, this self-stabilizing system is thrown out of balance and the true results of adaptations are never observed. To use an analogy, it is

like trying to adjust the shower temperature without ever feeling the water. How does this difference in the environment, complexity, and cybernetics effect the command system?

The NTC mental model is a complex training command system. The outer circle represents the semi-controlled environment in which the Bluefor and Opfor fight (see figure 8).

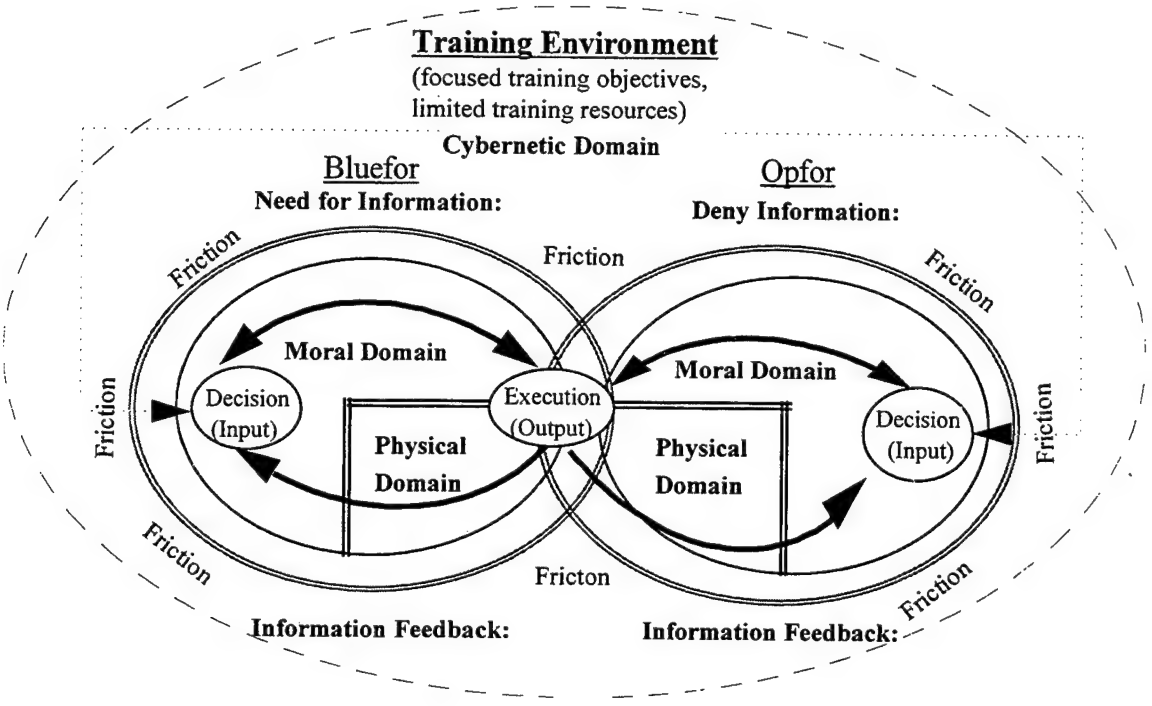

Figure 8: Complex training command system

As in the theoretical model, the execution circle represents the reconnaissance assets executing their missions. The problem commanders are having with reconnaissance is that they are not getting enough information to support the decisions on the employment of their forces. The reconnaissance studies have attributed the problem to the ability of task force commanders, scout platoons, and more recently, reconnaissance planning. Has the solution to this problem actually been there the whole time, but not observed because it is not seen in the mental model structure of the NTC? The commander, as the critical

variable, does not receive the true effects of the negative feedback loops that he would receive in combat. The same can be deduced about his soldiers, the indicator variables. The anticipation and adaptation of events in the theoretical model would drive the commander to employ his reconnaissance assets in a complementary manner. With the value of human life high in his priorities, the commander would want to employ his assets to best preserve his forces while obtaining his information needs.

Chapter Six: Conclusion

This monograph examined whether systems thinking could identify why, despite the efforts of the Army, the reconnaissance problem remains unsolved. Using a theoretical model, the monograph examined the mental model of the reconnaissance studies and found that the true problem is not seen. The cybernetic feedback process in the complex-adaptive command system acts as a stabilizing force. In the NTC mental model, this stabilizing force does not exist. If it did exist, then units would not continually experience 50% losses in their reconnaissance forces over the last decade.[101] The big question is how do we receive the benefits of the feedback loops, in a peace time training environment, to reap their stabilizing influence. More importantly, does the environment of the NTC force commanders to adopt solutions that may "win" simulated war, but be inappropriate for actual combat?

An obvious solution is to educate leaders and soldiers in the moral aspects of war and its enabling and disabling effects. The training scenario should incorporate these effects as much as possible and discuss them in after action reviews. The Army spends a lot of time evaluating the battle using the battlefield operating systems of maneuver,

intelligence, fire support, mobility and countermobility, air defense, command and control, and combat service support. There is very little emphasis, however, on the moral domain and its impacts on these battlefield operating systems. A review of recent Center for Army Lessons Learned (CALL) Combat Training Center Trends publications found similar lack of emphasis. These CALL quarterly publications report trends that observer/controllers have noticed over a few rotations. They can not report as a trend something they can not observe. For similar reasons, the moral element was not evident in the reconnaissance studies.

In contrast to these contemporary studies, the Armor School conducted a similar reconnaissance study, published in 1952, in which the moral domain was very evident. The researchers surveyed over 300 World War II and Korean War veterans with combat experience conducting reconnaissance operations. Their mental model resembles the theoretical systems model very closely. An interesting observation of this study was that during training for combat, units were taught that the correct method to conduct reconnaissance was stealth and infiltration. In combat, however, units tended to have to fight for information.[102] BG T.B. Thompson, who commanded one of the combat commands of the 7th Armored division was quoted in this study.

> "We lost many vehicles from surprise fire which could have been avoided by light armor. Most losses were due to machine gun fire...In my opinion, no armor on 1/4 tons (the jeep) caused great delay and destruction of vehicles and lowering of morale ...We didn't get the information we should have had. This, in my opinion, was due to loss of morale because of high losses in men and vehicles."[103]

In this complex-adaptive environment of combat in World War II and the Korean War, units found that the enemy was not going to stand by and let light, mobile forces observe

them. Consequently, units had to adapt and reconnaissance forces became more combined arms formations.[104]

Solutions are often seen as rigid "either-or" choices.[105] Conclusions of the reconnaissance studies tended to favor stealth over aggressive reconnaissance. The Army went to HMMWV equipped scout platoons because they were more stealthful. Stealth is an effect on the enemy. Relying solely on the stealth method puts the initiative with the enemy and makes him the hunter and the scouts the hunted. It should be of little surprise that the NTC casualty rate of these "stealthful" HMMWV platoons did not improve. Stealth can be enabled by using combined arms tactics. The question is not what method is better, stealth or aggressive reconnaissance. The answer is both. One enables the other.

Commander's need to set the conditions for the reconnaissance forces to acheive success. For example, what if a brigade commander sent a company team to seize a limited terrain objective in order to establish a firing point for an artillery battery. The artillery battery's mission was to fire on known enemy locations, obtained from technical reconnaissance means, to support the insertion of the scouts. The enemy would have more than one problem to worry about. Instead of the enemy being the sole hunter and the scouts the hunted, the moral forces would be turned. This aggressive, taking the initiative-type action would enable the moral forces of the reconnaissance assets and disable the enemy's. Like Sledge's company commander actions on Peleliu, knowing that fire was coming down on the enemy and not you is comforting.

This type of action is even further enhanced by combining the synergistic effects of all the ground, air, and technical reconnaissance assets. Since the Gulf War, one of the

principles of the military intelligence community is broadcast dissemination of information. This principle means to push intelligence information from national, theater and other intelligence assets on down to the tactical units, while the tactical units pull information from higher.[106] If a machine can obtain some of the information requirements, then the moral forces are lessened. Commanders need to intuitively understand what combinations of these reconnaissance assets work, when, and how. Operating in a complex-adaptive command system-type environment will push him to anticipate the best use of his reconnaissance assets in order to prevent painful, gut-wrenching negative feedback. The best way to improve the system is to lessen the delays of the feedback. The quicker the commander can understand what is happening to his reconnaissance assets the quicker he can adjust. System thinking provides perspective on problems, but does it provide solutions?

The disadvantage of the theoretical system model is it did not address many of the contemporary reconnaissance issues. The requirement for a brigade reconnaissance troop, the future scout vehicle, and specifics on reconnaissance and surveillance planning are a few of the current issues. Systems thinking does offer perspective, however, on how to deal with the complexity of many interacting variables. In a complex-adaptive command system, certainty is not possible.[107] Do not become dependent on over centralized control or relying on one variable. This limits the variables the enemy has to counter and your flexibility.

Systems thinking requires looking at the whole instead of the part. It means challenging assumptions to find hidden structures in thinking. This monograph developed

a theoretical model of the environment of reconnaissance operations. The theoretical systems model is applicable to past, current, and future heavy brigade organizations. The theoretical model is like a blueprint which shows us how something works. The critical variable in the system is the commander. Success is largely determined on his intuitive ability to anticipate and adapt to situation as it is, in the environment that it exists, and not how he wishes the situation was. No amount of improvement of the indicator variables, the reconnaissance assets or any other asset, will change this.

Appendix I: Reconnaissance Study Summary

* **Study One:** U.S. Army Training Board White Paper on Enhancement of Reconnaissance and Counterreconnaissance
* **Study Two:** U.S. Army Armor School Assessment of Reconnaissance and Counterreconnaissance at the NTC
* **Study Three:** Rand Study, Applying the NTC Experience: Tactical Reconnaissance and Counterreconnaissance
* **Study Four:** Rand Study, Battalion Reconnaissance Operations at the NTC

	Study One*	Study Two*	Study Three*	Study Four*
Year Published	10 June 1986	February 1987	October 1987	1996
Methodology	- Discussion with units, instructors, observer/controller (O/Cs)	- Observation of an NTC rotation - Reviewed Take Home Packages - Interviews with unit, (O/Cs)	- Observation of NTC rotations - Observation data collection of 50 battles - Reviewed Take Home Packages - Interviews	- Observation of NTC rotations - Observation data collection of 41 battles - Reviewed Take Home Packages - Interviews
Assumption	-NTC replicates reality (acknowledges certain training distortion)	NTC replicates reality (acknowledges certain training distortion)	NTC replicates reality (acknowledges certain training distortion)	NTC replicates reality (acknowledges certain training distortion)
Limitation	- Peace time training environment - NTC focus at that time was task force operations, not brigade	-Peace time training environment - NTC focus at that time was task force operations, not brigade	-Peace time training environment - NTC focus at that time was task force operations, not brigade	-Peace time training environment - NTC focus is brigade operations
Study Focus	-TF recon, counter-recon operations -Does not address brigades role or other recon assets	- Stated focus was Bde and TF recon, counter-recon operations -Actual focus, scout platoon	- TF recon operations	- TF recon operations (examined the "fixes") - TF staff recon planning
Major Conclusion	-Lack of operational knowledge of TF commanders = weakness of recon - Scout Plt organization flawed(too small) - TF 2LT S-2s ill prepared for job - Doctrinal deficiencies	- Lack of emphasis of recon operations by TF commander - Effective recon= time available for scout plt to "get the job done" -M3 Unsatisfactory recon vehicle - Doctrinal deficiencies	Strong correlation between successful recon and successful offensive operations - Lack of emphasis of recon operations by TF -M3 Unsatisfactory recon vehicle commanders - TFs do not effectively use all reconnaissance assets	- Scouts better equipped, better at mission accomplishment - Scout survivability remains critical (daylight specifically) - Lack of detail TF planning, failed to use all available recon assets

Major Recommendation	-Improve battalion Precommand Course -New, low silhouette vehicle needed - Improve S2 school training	- Increase scout plt size - New, low silhouette vehicle needed (likes Opfor HMMWV)	- Sct plt ldr course - Improve S2 school training - New, low silhouette vehicle needed (likes Opfor HMMWV) - Better radios, thermal sites, GPS	- Need to improve TF staff and command operations - More school emphasis on Bde and Bn operations - Either a new vehicle or mix of vehicles needed + changes in doctrine of employment
Fixes	- Battalion Precommand Course improved to highlight reconnaissance operations. - Scout platoon changed from six Bradleys to 10 HMMWV - Scout Platoon Leader Course created - Scout platoons equipped with new and better radios, dismountable thermal sites, Global Positioning System (GPS) - More doctrinal emphasis on reconnaissance operations - Added S2 training emphasis at the MI school - NTC scenarios revised to provide more opportunity for reconnaissance			- Army conducted reconnaissance symposium in October of 1996 to examine why units are still having problems conducting reconnaissance operations

Appendix II: Operational Acronyms and Abbreviations

ADA	Air Defense Artillery
ALO	Air Liaison Officer
BG	Brigadier General
Bluefor	Blue Forces
CAC	Combined Arms Center
CAS	Close Air Support
C4I	Command, Control, Communications, Computers, and Intelligence
CCIR	Commander's Critical Information Requirements
COLT	Combat Observation and Lasing Team
EEFI	Essential Elements of Information
FFIR	Friendly Forces Information Requirements
GPS	Global Positioning System
HMMWV	High-Mobility Multipurpose Wheeled Vehicle
HUMINT	Human Intelligence
IEW	Intelligence and Electronic Warfare
METT-T	Mission, Enemy, Terrain, Troops, and Time available
MI	Military Intelligence
MILES	Multiple Integrated Laser System
NAI	Named Area of Interest
NTC	National Training Center
OPCON	Operational Control
Opfor	Opposing Forces
PIR	Priority Intelligence Requirements
TRADOC	Training and Doctrine Command

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[3] Peter Senge, The Fifth Discipline: The Art and Practice of the Learning Organization (New York: Doubleday, 1990), 68.

[4] Jennifer James, Thinking in Future Tense (New York: Simmon and Schuster, 1996), 189.

[5] Sun Tzu, The Art of War , translated by Ralph D. Sawyer(Boulder: Westview Press, 1994), p. 179.

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[7] Ibid., 70.

[8] BG E.S. Leland, National Training Center Commander's Memorandum (Fort Irwin, CA: Headquarters, NTC and Fort Irwin, 20 November, 1985), p.1.

[9]Goldsmith, 1996, 15.

[10] Dietrich Dorner, The Logic of Failure (New York: Metropolitan Books, 1994), p. 98.

[11]Ibid., 98.

[12] U.S. Army, FM 100-5, Operations (Washington D.C.: Department of the Army, June 1993), 1-1.

[13] FM 34-8, 1992, 1-4.

[14] U.S. Army, FM 100-40, Tactics (Washington D.C.: Department of the Army, June 1997), 15-1.

[15] Ibid., 15-8.

[16] Ibid., 15-8.

[17] The exception is the experimental brigade with the 4th ID (mech). This brigade is experimenting with a brigade reconnaissance troop.

[18] FM 34-8, 1992, Glossary-4.

[19] Ibid., 1-3.

[20] FM 100-40, 1997, 15-2.

[21] Ibid., 15-4.

[22] U.S. Army, FM 17-98, Scout Platoon (Washington D.C.: Department of the Army, September 1994), 1-5. The battalion scout platoon consists of 10 HMMWV wheeled vehicles manned by 30 soldiers.

The vehicles are lightly armed with 50 caliber machine guns and MK-19 grenade launchers (total of 5 each in the platoon), and thermal sights with the capacity to see out to 3000 to 4000 meters. The scout platoon can man up to eight observation posts (OPs) for short duration and three OPs for long duration's. The distance the scout platoon can operate from the main body is restricted to the range of its communications and range of supporting indirect fires (artillery).

[23] U.S Army, FM 17-97, Cavalry Troop (Washington D.C.: Department of the Army, October 1995), 1-2. "The heavy cavalry troop consists of 6 officers and 126 enlisted soldiers. The troop is organized into a headquarters section, two scout platoons, two tank platoons, a mortar section, and a maintenance section (page 1-2). ...It can perform its missions under all visibility conditions and in any terrain that supports heavy armor movement. The integrated thermal sights on the M1A1 and M3 CFV along with ancillary passive night sights and night vision devices authorized to the troop provide an outstanding nighttime/reduced visibility acquisition and fighting capability. (page 1-17)."

[24] FM 100-40, 1997, 15-4.

[25] U.S. Army, FM 71-3, The Armored and Mechanized Infantry Brigade (Washington D.C.: Department of the Army, January 1996), 4-5.

[26] U.S. Army, FM 17-95, Cavalry Operations (Washington D.C.: Department of the Army, Jun 1996), 3-9.

[27] Ibid., 3-22.

[28] Ibid., 3-14.

[29] Ibid., 3-24.

[30] Ibid., 3-1. Surveillance is the systematic observation of airspace or surface areas by visual, aerial, electronic, photographic, or other means (page 3-2).

[31] Ibid., 3-2.

[32] FM 100-40, 1997, 15-4

[33] U.S. Army, FM 34-2-1, Reconnaissance and Surveillance and Intelligence Support to Counterreconnaissance (Washington D.C.: Department of the Army, June 1991), 3-18. Firefinder radar capabilities: The AN/TPQ-36 can detect mortars and artillery out to 12 kilometers and detect rockets out to 24 kilometers. The AN/TPQ-37 detects artillery and mortars out to 30 kilometers and rockets out to 50 kilometers.

[34] FM 100-40, 1997, 15-4.

[35] Carol G. Braham, Project Editor, Random House Webster's Dictionary (New York: Ballantine Books, 1996), 593.

[36] MAJ Steve Stanfield, CPT Robert Plummer, and CPT Dee Christensen, U.S. Army Training Board White Paper on Enhancement of Reconnaissance and Counterreconnaissance Techniques (Fort Monroe: U.S. Army Training Board White Paper, 10 June 1986), 1.

[37] Ibid., 2.

[38] Ibid., 3. Further conclusions: Doctrinal, training, and equipment deficiencies are a contributing factor (page 2).

[39] Ibid., 10. Further recommendations: Establish a scout platoon leaders course; increase the size of the scout platoon; improve the scout radio communication; improve scout platoon sergeant training; improve training of S2s; and doctrinal improvements to FM 17-98, Scout Platoon.

[40] MAJ John D. Rosenberger, An Assessment of Reconnaissance and Counterreconnaissance Operations at the National Training Center (Fort Knox: The Armor School, February 1987), 2. A key member to highlight is COL (retired) Sydney (Hap) Hazard. He is an Armor officer with extensive mounted reconnaissance experience in World War II, Korea, and Vietnam.

[41] Ibid., 2. Each brigade and battalion task force is given a written "Take Home Package" of observations and recommendations from the observer/controllers. The intent is that a unit can use the information from this product of support future training. These reports are available for analysis, with the unit's identification deleted, at the Center for Army Lessons Learned at Fort Leavenworth.

[42] Ibid., 1.

[43] Ibid., 3. The team's observations of problems with the NTC scenario were that the task forces were forced to attack into prepared defenses instead of doctrinally attacking. Cavalry units are not replicated moving in front of the brigades. Battalion scouts are given too little time in the scenario to accomplish their missions. OPFOR scouts have major advantages in knowledge of terrain and more time to conduct reconnaissance.

[44] Ibid., 3.

[45] Ibid., 4.

[46] Ibid., 16.

[47] Martin Goldsmith and James Hodges, Applying the National Training Center Experience: Tactical Reconnaissance (Santa Monica: The Rand Corporation Arroyo Center, October 1987), iii. "The Arroyo Center is the Army's federally funded research and development center for studies and analysis operated by the Rand Corporation."

[48] Ibid., 8.

[49] Ibid., v.

[50] Ibid., v.

[51] Ibid., 11.

[52] Ibid., 4.

Attack Outcome According to Recconaissance Status (Bluefor)

Recon	Total missions	Success	Battle Come Failure	Standoff
Good	13	9	1	3
Poor	50	4	38	8
Unclear	14	4	4	6

[53] Ibid., 7.

[54] Ibid., 18.

[55] Ibid., 4.

[56] Ibid., 69. Other recommendations: More doctrine emphasis on importance of reconnaissance, use of other reconnaissance assets, develop a textbook on reconnaissance, develop scout platoon leaders course, dismountable thermal viewer and more night vision goggles and binoculars, better communication and navigation equipment.

[57] The Army conducted two assessment plans to formally make recommendations on solving the reconnaissance problem. Once such assessment was the "Cavalry/Reconnaissance NET Assessment - Master Plan" was published in July, 1988 (see biography). In response to a tasking from the Combined Arms Development Activity (CADA), the Armor School developed its recommendations to improve reconnaissance operations. The Armor School's plan incorporated many of the recommendations of the reconnaissance studies and rated the improvement of the scout platoon as one of its "must have priorities" (page 1-9). The plan recommended a HMMWV-Bradley mix of 10 vehicles for the scout platoon along with numerous other improvements. The plan rated a brigade scout platoon as a "would like to have" (page 1-9). The Armor School's higher headquarters used this NET assessment and the reconnaissance studies to develop a more encompassing assessment plan.

The Combined Arms Activity Plan, "Reconnaissance, Surveillance, and Counterreconnaissance Special Study Group" was developed in response to a tasking from the TRADOC commander, dated 15 August, 1988 (see biography). The CAC plan supported the testing of new scout platoon organizations as recommended by these previous works. The CAC plan stated the concept of an organic brigade scout organization was valid, but required further study (page 54).

[58] Goldsmith, 1996, 2-3. "Fixes" include: Institution of scout platoon leaders course at Fort Knox; two revisions of FM 17-98, Scout Platoon; added doctrinal treatment of reconnaissance with publication of FM 71-123; expansion of the treatment of tactical reconnaissance in MI doctrine; added emphasis on S-2 training at Fort Huachuca; correction of MI company-grade officer shortage; added emphasis on reconnaissance in the precommand course at Fort Leavenworth; revision of scenarios at the NTC to provide more opportunity for reconnaissance; change from tracked to wheeled (HMMWV) vehicles for scout platoons; and added night vision and position/locations equipment for scouts.

[59] Ibid., ix.

[60] Ibid., 9.

[61] Ibid., 7.

[62] Ibid., 15.

[63] MAJ Michael N. Albertson, "Reconnaissance and Symposium Teleconference," (CALL Memorandum, 30 October 1996), 1.

[64] Senge, 41.

[65] James J. Schneider, Ph.d., Theoretical Paper No. 5: The Eye of Minerva: The Origin, Nature, and Purpose of Military Theory and Doctrine (Fort Leavenworth: U.S. Army Command and General Staff College), 9.

[66] Marshall Foch, The Principles of War, trans. by Hilaire Belloc (London: Chapman and Hall, LTD, 1918), 7.

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[68] Braham, 429.

[69] David G. Chandler, The Campaigns of Napoleon (New York: Macmillan Publishing Co., Inc., 1966), 155.

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[71] Anthony Kellett, Combat Motivation: The Behavior of Soldiers in Battle (Boston: Kluwwer-Nijhoff Publishing, 1982), 4.

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[76] LT GEN Montgomery Meigs, "The Moral Domain," SAMS Seminar 2 Lecture Notes, 15 Sept 1997)

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[86] Ibid., 90.

[87] Doubler, 255.

[88] Kauffman, Jr., 20.

[89] Ibid., 24.

[90] Senge, 89.

[91] Senge, 78.

[92] Dorner, 75.

[93] Ibid., 75.

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[96] S.L.A. Marshall, Men Against Fire (Glouster, Peter Smith, 1947), 108.

[97] Ibid., 120.

[98] Senge, 8.

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[100] Kellett, 264.

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